



NARASIMHA REDDY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad

Accredited by NAAC with A Grade, Accredited by NBA

Humanities & Sciences

QUESTION BANK

Course Title : Chemistry

Course Code : CH1202BS

Regulation : NR21

Course Objectives:

- ❖ To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- ❖ To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- ❖ To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and industry.
- ❖ To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.
- ❖ To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

Course Outcomes (CO's)

The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.

- ❖ Apply knowledge and understanding of water treatment process to real world problems.
- ❖ Interpret the knowledge of electrochemical phenomenon involved in developing batteries and understanding fuel cells fundamentals.
- ❖ Ability to determine appropriate method of protection against corrosion for a metal based on its applications in different fields.
- ❖ Classify and characterize different polymers engineering materials and apply its knowledge to select suitable materials for specific applications.
- ❖ The required skills to get clear concepts on basic spectroscopy and applications to medical and other fields.

UNIT-I

Molecular Structure & Theories of Bonding

S.No	Questions	BT	CO	PO
Part – A (Short Answer Questions)				
1	Calculate the bond order of O ₂	L2	1	1
2	Calculate the bond order of F ₂	L2	1	1
3	Calculate the bond order of N ₂	L2	1	1
4	ABMO have higher energy than BMO. Justify.	L4	1	3
5	Compare the splitting of tetrahedral, octahedral and square planar complexes	L4	1	3
6	How does doping of Si increases its conductivity?	L2	1	2
7	How does doping of Ge increases its conductivity?	L2	1	1

8		Using band structure justify why non-metals are electrical insulators?	L4	1	3
9		Using band structure justify why most metals are electrical conductors?	L4	1	3
10		What are the limitations of CFT?	L1	1	1
Part – B (Long Answer Questions)					
11	a)	Categorise d-orbitals based on the spatial orientation of electron density distribution of atomic d-orbitals in tetrahedral complexes.	L4	1	3
	b)	Predict the magnetic character of O ₂ molecule using MOT.	L3	1	2
12	a)	Categorize d-orbitals based on the spatial orientation of electron density distribution of atomic d-orbitals in octahedral complexes.	L4	1	3
	b)	Elucidate the different molecular energy levels of diatomic F ₂ molecule	L2	1	1
13	a)	Categorize d-orbitals based on the spatial orientation of electron density distribution of atomic d-orbitals in square planar complexes.	L4	1	3
	b)	Illustrate the formation of N ₂ molecule using MOT.	L2	1	1
14	a)	Illustrate the formation of MOs using LCAO method.	L2	1	1
	b)	How does band theory explain the metallic character of Li?	L3	1	2
15	a)	Classify solids based on band theory. Explain each individually.	L2	1	1
	b)	Explain the postulates of MOT.	L1	1	1
16	a)	Explain the postulates of CFT.	L1	1	1
	b)	Compare the electrical conductivities of intrinsic and doped semiconductors using band theory.	L4	1	1

UNIT-II

Water & It's Treatment

NAME S.No	Questions	BT	CO	PO
Part – A (Short Answer Questions)				
1	Write the chemical reactions involved in the regeneration of exhausted resins.	L1	2	1
2	How many grams of MgSO ₄ have to be dissolved per liter to obtain 240ppm of hardness?	L2	2	1
3	Why is the calgon method better than other internal treatment methods?	L2	2	2
4	Why does hard water consume a lot of soap?	L2	2	2
5	Why is the presence of even a small amount of silica dangerous to the boilers?	L2	2	1
6	What happens when hard water is boiled? Give equations.	L2	2	1
7	Presence of CO ₂ in boiler feed water should be avoided. Give reasons.	L2	2	1
8	What is the principle of internal treatment?	L1	2	1
9	What is the main advantage of the RO process over the ion-exchange process?	L2	2	1
10	Why water from natural sources should not be fed to boilers?	L2	2	1
Part – B (Long Answer Questions)				
11	a) Interpret how the internal treatment process can help the boiler operate at its best.	L4	2	3

	b)	Summarize the specifications for safe drinking water given by WHO. How does municipal water treatment meet the given specifications?	L2	2	1
12	a)	Justify why the ion-exchange process is also called deionisation process.	L4	2	3
	b)	Identify the hardness causing salts and calculate the total, temporary and permanent hardness: H ₂ SO ₄ - 24.09 mg/L NaHCO ₃ - 124.56 mg/L Ca(HCO ₃) ₂ - 102.69 mg/L MgNO ₃ - 109.07 mg/L MgSO ₄ - 124.34 mg/L CaCl ₂ - 208.08 mg/L K ₂ SO ₄ - 275.67 mg/L CaSO ₄ - 206.89 mg/L Mg(HCO ₃) ₂ - 189.11 mg/L NaCl- 231.09 mg/L	L3	2	2
13	a)	Reverse osmosis is the finest filtration known. Justify	L4	2	3
	b)	How can you determine if you are past breakpoint chlorination?	L4	2	3
14	a)	What are the causes and problems due to scales and sludges? Discuss the methods for treatment of scales and sludges	L1	2	1
	b)	Explain the process of ozonation and chlorination involved in disinfection of water.	L1	2	1
15	a)	Write a short note on caustic embrittlement.	L1	2	1
	b)	What is carbonate and noncarbonate hardness of water? List out various disadvantages of using hard water.	L1	2	1
16	a)	How can presence of O ₂ in feed water damage the boiler? Suggest methods of removal of O ₂ .	L2	2	1
	b)	Discuss briefly the method used for the analysis of residual Cl ₂ .	L2	2	2

UNIT-III

Electrochemistry , Batteries and Corrosion

S.No	Questions	BT	CO	PO
Part – A (Short Answer Questions)				
1	Why are fuel cells better than an electric power plant, using the same fuel?	L3	3	2
2	Calculate E _o cell of Zn-Ag cell. (E _o Zn = -0.76V ; E _o Ag = 0.80V)	L3	3	2
3	Why does Fe corrode faster than Al even though E _o of Fe is greater than E _o of Al	L2	3	2
4	Why is the E _o of Zn assigned a negative value and for copper it is assigned a positive value?	L2	3	1
5	Wire mesh corrodes faster at the joints. Why?	L2	3	1
6	What is the effect of CO ₂ on corrosion of Fe?	L2	3	1
7	Why is it not possible to measure electrode potential of an isolated half cell?	L3	3	2
8	Why is glass electrode preferred to quinhydrone electrode in measuring pH of a solution?	L2	3	1
9	Why does corrosion of water filled steel tanks occur below the waterline?	L2	3	1
10	Predict the nature of corrosion that would occur if an iron gutter is nailed using Al nails.	L3	3	2
Part – B (Long Answer Questions)				
11	a) Lithium ion batteries are the future of energy storage. Justify	L4	3	3

	b)	Hydrogen oxygen cells are viewed as decarbonised energy systems. Explain.	L3	3	3
12	a)	Electroless plating drastically reduces cost when compared to electroplating. Explain.	L3	3	2
	b)	Describe how iron can be made corrosion resistant by cathodic protection method.	L2	3	1
13	a)	Compare and contrast the different hot dipping processes applied for protection of iron and steel articles.	L4	3	3
	b)	Explain with an example how lithium primary cells are replacing the older traditional primary traditional cells.	L2	3	1
14	a)	Explain why PEFCs are a promising technology in realizing sustainable power supply.	L3	3	2
	b)	Elucidate construction, working and applications of lead acid batteries	L1	3	1
15	a)	Calculate the emf of Zn-Cu cell constructed using ZnSO ₄ solution of 0.05M and CuSO ₄ solution of 0.10M. ($E^{\circ}_{Cu} = 0.34V$; $E^{\circ}_{Zn} = -0.76V$)	L3	3	2
	b)	Explain the factors in the nature that affect the rate of corrosion.	L1	3	1
16	a)	Write a detailed note on oxidation corrosion and discuss the role of nature of oxides formed.	L1	3	1
	b)	Discuss how the nature of metal can affect the rate of corrosion.	L1	3	1

UNIT-IV

Engineering Materials

S.No	Questions	BT	CO	PO	
Part – A (Short Answer Questions)					
1	Why thermosetting plastics cannot be reused and reshaped?	L2	4	1	
2	Rubbers become stiff when stretched. Explain	L2	4	1	
3	What is the need for vulcanisation of raw rubber?	L2	4	1	
4	State the significance of pour point of lubricants.	L1	4	1	
5	Teflon is highly resistant to chemicals. Justify.	L4	4	3	
6	PVC is soft and flexible whereas bakelite is hard and brittle. Give reasons.	L3	4	2	
7	Define composite material	L1	4	1	
8	Why is a ceramic material used to pack shock absorbers?	L3	4	2	
9	Name any 3 fibres used for preparing compositors.	L2	4	2	
10	What type of lubricants are used for transformers?	L3	4	2	
Part – B (Long Answer Questions)					
11	a)	Write a brief note on properties of lubricants.	L1	4	1
	b)	Explain how lubricants work. Explain any 1 mechanism of lubrication in detail.	L1	4	1
12	a)	Write a detailed note on classification of lubricants.	L1	4	1
	b)	What are elastomers? List out the engineering applications of elastomers.	L1	4	1
13	a)	Compare and contrast the properties and applications of Bakelite, PVC, Teflon	L4	4	3
	b)	Write a detailed account on classification of polymers.	L1	4	2

14	a)	List out the different ingredients used in the compounding of plastics and their advantages.	L1	4	1
	b)	What is natural rubber? Explain its vulcanisation.	L1	4	1
15	a)	FRPs are the super materials which are shaping our future. Comment.	L3	4	2
	b)	Biodegradable polymers offer a possible solution to waste disposal problems. Explain	L3	4	2
16	a)	Do you think conducting polymers are better than semiconductor materials?	L3	4	3
	b)	Write a note on classification of polymers.	L1	4	2

UNIT-V

Spectroscopy

S.No	Questions	BT	CO	PO	
Part – A (Short Answer Questions)					
1	Most absorption bands in the UV spectra are very broad. Give reasons.	L3	5	2	
2	Indicate the type of energy change brought when the gaseous molecule is exposed to the following radiations: a) IR b) UV-Visible c) Microwave	L3	5	2	
3	How many normal modes of vibrations are possible for: a) ethane b) benzene	L3	5	2	
4	Why homonuclear diatomic molecules are microwave inactive while hetero diatomic molecules are microwave active?	L3	5	3	
5	Distinguish between chromophores and auxochromes with suitable examples.	L2	5	1	
6	What is Nuclear magnetic resonance spectroscopy?	L1	5	1	
7	How many normal modes of vibrations do you expect from: a) CO ₂ b) CHCl ₃	L4	5	3	
8	What do you understand by selection rule?	L1	5	1	
9	What type of excitation takes place in CH ₃ CN in UV spectroscopy?	L2	5	2	
10	What is meant by absorption spectroscopy?	L1	5	1	
Part – B (Long Answer Questions)					
11	a)	Explain the mechanism and selection rules of rotational spectra	L1	5	1
	b)	Write a brief note on the different energies in a molecule	L1	5	1
12	a)	Write the basic principle of IR spectroscopy. Give the various molecular vibrational modes.	L1	5	2
	b)	Describe the different types of electronic transitions in UV-Visible spectroscopy	L1	5	2
13	a)	Write a brief note on the selection rules of UV-Visible spectroscopy.	L1	5	2
	b)	Write a note on applications of UV-Visible spectroscopy.	L1	5	1
14	a)	Discuss the different factors affecting the chemical shift.	L1	5	1
	b)	What is meant by shielding and deshielding in NMR spectroscopy	L1	5	1
15	a)	What are the selection rules for IR spectroscopy? Give any THREE applications of IR Spectroscopy	L1	5	1

	b)	What is the principle of NMR spectroscopy?	L1	5	1
16	a)	Write a note on principle and types of spectroscopy.	L1	5	1
	b)	Write a note on MRI.	L1	5	1

* **Blooms Taxonomy Level (BT)** (L1 – Remembering; L2 – Understanding; L3 – Applying; L4 – Analyzing; L5 – Evaluating; L6 – Creating)

Course Outcomes (CO)

Program Outcomes (PO)

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HOD, H&S